

State Advisory Board
Air Pollution
Use of Tire-Derived Fuel in Virginia
November 2007

I. Purpose

The purpose of this report is to study the use of scrap tires for fuel in Virginia. The study discusses emissions estimates for tire derived fuel (TDF), public perception of burning TDF, and air permitting implications of burning TDF.

II. Background

A. Scrap Tire Generation Rate in Virginia

The Rubber Manufacturers Association (RMA) estimates that approximately one waste tire is generated per person per year from on-road vehicles. By this measure, about 7,650,000 tires are scrapped each year in the Commonwealth of Virginia.

Using the RMA estimate of 22.5 pounds per passenger tire equivalent, this amounts to 86,000 tons per year. Based on Virginia DEQ data that show 82,912 tons have gone to beneficial reuse in 2006, this means that 96% of Virginia's scrap on-road tires were beneficially reused. Thus Virginia is reusing tires at a much higher rate than the national average of 80% reported by RMA.

However, neither the RMA nor the Virginia DEQ estimates include off-road, non-DOT-certified tires (heavy equipment, industrial, agricultural, etc.), and there is no reliable way to add such tonnages to the figures above. It would be desirable to have an estimate of off-road scrap tires so the Commonwealth will know how much of this source of rubber is being lost (see Recommendation 7 in Section V below).

B. Beneficial Uses of Scrap Tires Generated in Virginia

For calendar year 2006, the Virginia Department of Environmental Quality recorded 82,912 tons of waste tire material going to beneficial uses. As Attachment 1 and Figure 1 show, 53% of the tires were used for "civil engineering," which includes landfill drainage (28%), landfill daily cover (23%), and septic chips (2%).¹ Tire-derived fuel (TDF) accounted for about 41% of the tires, and 2% were reduced to ground rubber

¹ Septic tanks typically rest on a bed of gravel. Tire chips are cheaper and lighter and drain better than gravel. Other civil engineering uses are fills and embankments, foundation backfills, and vibration-dampening layers.

for recycled products². Only 620 tons (less than 1%) were documented as being landfilled in Virginia in 2006, leaving 3% “unknown.”

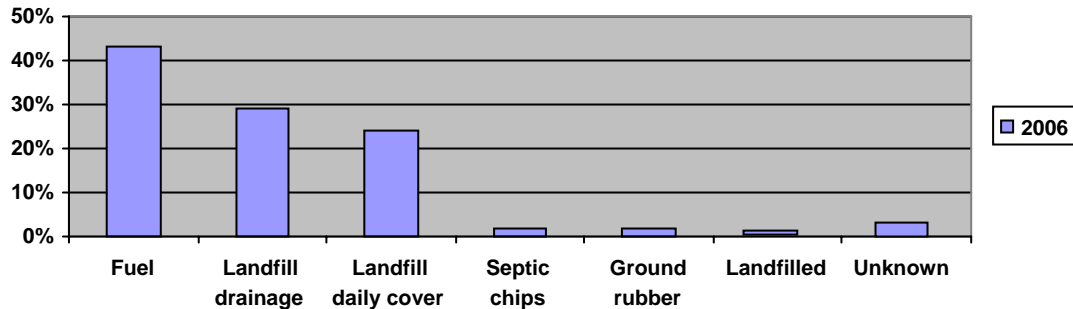
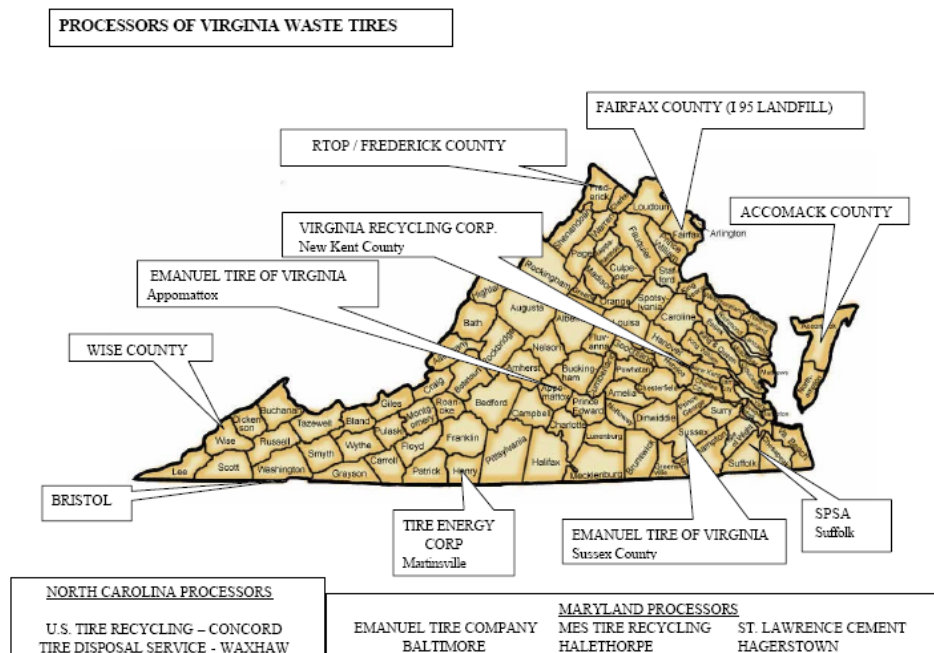


Figure 1 -- Uses of Scrap Tires in Virginia, 2006

“Cracking” tires (by pyrolysis, gasification, or microwave) is another way to use scrap tires. It is heavily promoted but has not proven economically feasible in the United States. At one time Virginia was home to a \$10 million pyrolysis plant (Tire Recyclers, Inc., in Charles City County), but it never operated successfully.

Not all Virginia scrap tires are used in Virginia. The civil engineering uses for Virginia-generated tires occurred inside Virginia, but only 14% of the TDF from Virginia tires was burned in Virginia in 2006. Most of the TDF is burned in North and South Carolina, with some used in Maryland. Rising fuel prices have made it economical to ship used tires from Virginia to North Carolina and Maryland. Also, the location of some waste tire handlers near the borders or in other states may have favored the use of TDF outside Virginia. The \$22.50/ton reimbursement from Virginia (see Section C below) is an incentive, but it does not favor out-of-state users. Why a larger market for TDF has not developed in Virginia is not entirely clear. It is *not* because Virginia lacks waste tire processors, as this map from the DEQ website shows:

² Ground rubber can be used to make modified hot mix asphalt, pour-in-place recycled rubber surfacing, playground surfaces, and crumb rubber turf grass and can be processed into consumer products like irrigation hoses and even handbags (Richmond *Times-Dispatch*, August 27, 2007).



It may be that a higher reimbursement or other incentives are needed for burning TDF in Virginia (see Recommendations 4 and 6 in Section V).

C. State Funding for Scrap Tires Generated in Virginia

Virginia funds its waste tire activities with a \$1 per tire recycling fee on tires sold at retail. The fee was only 50¢ per tire when it began in 1989 but was increased to \$1 in 2003, with the additional 50¢ used exclusively to clean up tire dumps. The fee is scheduled to revert to the original 50¢ on June 30, 2008, even though not all the dumps will be cleaned up by then. DEQ's website, www.deq.virginia.gov/wastetires/, describes the waste tire management program.

The base 50¢ supports all other scrap tire programs, including the End User Reimbursement (EUR) Program, by which DEQ pays companies that use scrap tires up to \$22.50 per ton (equivalent to 25¢ per tire). This EUR Program, in place since 1994, has been responsible for major private processing and end user investments in Virginia, so that the beneficial use rate has grown from 50% in 1994 to almost 100% at present. If the fee reverts to 50¢/tire in mid-2008, DEQ will collect approximately \$2,500,000 per year to support both the EUR Program and cleanups of tire piles. Thus, if the fee reverts to 50¢/tire, there may be pressure to use the money to clean up dumps at the expense of efforts to assist present markets or develop new ones. From the standpoint of encouraging the use of TDF, it would be desirable to continue the fee at \$1 per tire (see Recommendation 4 in Section V). After all tire piles are cleaned up, the additional revenue could be used to create more market incentives.

III. Use of Tires as Fuel

Tires are a hydrocarbon-based material (polymerized rubber) derived from oil and gas (Gray 2004). Their heat content is 20-40% higher than coal: 7800 to 8600 kcal/kg [14,037 - 15,476 BTU/lb] for tires compared to 5550 to 7200 kcal/kg [9988 - 12,957 BTU/lb] for coal (*id.*). EPA testing shows that tire-derived fuel has a higher BTU value than coal (<http://www.epa.gov/epaoswer/non-hw/muncpl/tires/tdf.htm>). Tires typically have lower moisture content and (not counting the wire) a lower ash content than coal, which means higher energy use efficiency (*id.*). Tires also have a higher ratio of volatile to fixed carbon, which improves their ability to burn rapidly and completely (*id.*).

Facilities that can use TDF are cement kilns, industrial boilers at pulp and paper mills, electric utilities, waste-to-energy plants, and dedicated fuel facilities. Tires can be burned whole at cement kilns, which reduces processing costs but increases capital costs. Alternately, they can be shredded and mixed with coal or with waste paper and wood in industrial boilers. The EUR Program supports the use of Virginia tires at all the various facilities, even though they are out-of-state. Virginia origin must be proven using the DEQ Waste Tire Certification Form. Facilities in Virginia that use or once used TDF and facilities that have tested its use are listed in Attachment 2.

Tires contain steel in the bead (a loop of high-strength steel cable coated with rubber that keeps the tire seated on the wheel rim) and in the steel belts that reinforce the area under the tread. Cement kilns are the most efficient use of TDF, because the tires are burned whole, and the steel wire in the tires is useful in the production of cement. In other TDF applications, wire becomes part of the ash waste stream. Virginia has only one kiln, the Roanoke Cement plant in Botetourt County. A previous owner attempted to burn tires at this facility, but public opposition, lack of a reliable supply of tires, excess emissions, and high capital costs for a tire feed system halted the project.

Using scrap tires as fuel is good policy, provided the tires replace other fossil fuels without increasing air pollution or causing operational problems. The U.S. Environmental Protection Agency supports TDF, if properly permitted (EPA Fact Sheet, Attachment 3). The State Air Pollution Control Board should encourage tire-derived fuel as well, in order to recover the fuel value of the resource. See Recommendations 1,2,3, and 5 in Section V.

IV. Experiences Burning Tire-Derived Fuel in Virginia

A. Cost of Burning TDF

The costs associated with purchasing TDF stem from the processing costs (removing wire and shredding) and the costs of transporting tires to the facility that will burn them.

In general, TDF has been found to be a cheaper fuel (MMBTU/lb) than most of fuels TDF would be displacing (coal, etc). Reasons for this include the higher BTU content of TDF as compared to coal (about 30% higher), and the reimbursement from the End User Reimbursement Program. However, burning tires may turn out in some cases

to be more expensive because of the expense of permitting, with the expense of permitting increasing with public opposition.

B. Obstacles to Burning TDF

Few companies are interested in burning tires for fuel. There are three deterrents: (1) Permitting is necessary under the Clean Air Act, and expensive air pollution control equipment (or limits on the amount of TDF that can be burned) may be required. (2) The public has opposed the burning of tires. (3) Some boilers have experienced operational issues associated with burning TDF.

1. Recent Developments in Virginia

From the standpoint of promoting the use of tire-derived fuel, recent developments in Virginia are not encouraging. In July 2007 the Tire Energy Corporation, the only user of waste tires for fuel in Virginia, decided to close its Martinsville facility because there were not enough clients for steam and costs were too high.

The Cogentrix facility in Chesterfield County intended to resume using tire-derived fuel in August 2007, after a hiatus due to a retrofit of boilers and feed systems. However, a pending sale of the facility may delay the use of tire-derived fuel until 2008 or later, if ever.

To add to the problems, in June 2007 a decision by the D.C. Circuit Court of Appeals vacated two EPA rules and created uncertainty about what Clean Air Act requirements will apply to facilities that burn tires for fuel. On June 8, 2007, the D.C. Circuit Court issued a decision on litigation involving EPA's Section 112(d) MACT rule for industrial boilers (Boiler MACT) and its Section 129 rule controlling emissions from commercial and industrial solid waste incineration units. Concern exists about whether the burning of TDF in boilers would classify them as solid waste incinerators and whether this could trigger additional air regulatory requirements. This uncertainty may discourage potential Virginia users from choosing to burn tires in the near future.

2. Paper Mill Industrial Boiler Experience Burning TDF in Virginia

To get a better idea of the disincentives to using TDF, the SAB interviewed six pulp and paper mill facilities in Virginia and three elsewhere that either have burned tires as fuel or have performed burning trials but then chose not to continue, including a few facilities not listed in Attachment 1. The mills interviewed ran trials that involved burning tire-derived fuel only in industrial boilers at their sites. No other incineration devices were considered for trials at these sites. The lengths of the trials ranged from no trial at all (after deciding the obstacles were too great) to over 20 years. Most of the trials were conducted in the 1980s and 1990s, when air permitting regulations were less stringent than they are today.

Six major problems were reported: (1) Seven of nine plants felt they were hampered because the permitting process limited the amount of TDF they could burn, thereby limiting the economic advantage of using the cheaper source of fuel. (2) Five plants found the permitting process to be excessively difficult, lengthy, and costly. (3) Four plants observed that wires from the tires clogged the grates in the boilers, creating hot spots that required temporary shutdowns and increased maintenance costs. Some plants reported difficulties mixing the shredded tires with the wood fuel or other fuels. (4) Four plants reported excessive zinc in the ash, which for some of these plants would have kept the ash from being sold for a beneficial use. (5) Two plants encountered high costs of additional pollution controls, and one plant reported a decrease in the efficiency of its electrostatic precipitator when burning TDF. (6) Two plants faced strong negative public opinion.

3. Public Perception

Public opposition to burning tire-derived fuel is an important disincentive. It partially stems from certain well-publicized uncontrolled fires in the past. In March 2002, for example, a pile of over three million tires, accumulated over 30 years in Roanoke County, caught fire, and the County and nearby Roanoke City were covered with towering black clouds of smoke.



The tire pile fire began within just months of the Roanoke County Board of Supervisors' acceptance of a \$1.4 million grant from DEQ to remove the tires.

EPA's Emergency Response Team took over the site and EPA appropriated up to \$2 million to deal with the emergency. The tires burned for almost a month. The government's strategy was to control and contain the brush fire that accompanied the tire fire and let the tires burn out. EPA felt that if water were used to suppress the flames, it would result in more, not less, air and soil pollution.

This fire biased many people in southwest Virginia against any burning of tires. Controlled burning of tires in an industrial boiler, on the other hand, occurs with proper air-to-fuel ratios which prevent the clouds of black smoke from forming. See Recommendations 2 and 7 in Section V below on ways to be sensitive to public perceptions.

4. Air Emissions from Burning TDF

The chemical composition of tires needs to be examined in order to determine the impact of burning them on air emissions. Tires have less sulfur than many eastern coals, which means lower SO_x emissions, but many western coals have less sulfur than tires. TDF has a lower carbon-to-hydrogen ratio, theoretically reducing the greenhouse gas CO₂ emissions. Therefore, if TDF were burned instead of coal, greenhouse gas emissions could be reduced. Likewise lower nitrogen content of tires can marginally decrease NO_x emissions (Terry Gray, 2004, First Northeast Regional Scrap Tire Conference Albany, NY). The SAB emphasizes, however, that conclusions like these are generalizations. The results in individual cases depend on exactly what type of fuel is being replaced by tires and what configuration of boiler and air pollution control equipment exists at each site.

Tires contain as much chlorine or more than many coals, but the chlorine has been reduced in many newer tires as the chlorinated butyl inner liner has been replaced. Higher emissions of chlorides could be a problem, because EPA's (now vacated) MACT standard for industrial boilers contains limits on hydrogen chloride. Mercury appears to be lower in TDF as compared to coal. TDF has higher levels of zinc than coal, because zinc oxide is added to tires during the vulcanization process. Because tires have both environmental advantages and disadvantages compared to coal, the desirability of using tires depends on the application.

A number of emissions studies exist, with varying conclusions for burning TDF. According to EPA, testing has shown that TDF produces emissions that could be comparable to other conventional fuels (<http://www.epa.gov/epaoswer/non-hw/muncpl/tires/faq-tdf.htm>). However, the change in emissions when tires are burned depends on the facility configuration, the air pollution control equipment, and the type of fuel being replaced by TDF. In general, TDF is likely to emit more SO₂ than low-sulfur western coal and less SO₂ than eastern high-sulfur coal. It depends on the location that the coal comes from.

TDF can be used as a 10-20% supplement to other fuels in properly designed combustors with good combustion and add-on particulate controls. A dedicated tire-to-energy facility specifically designed to burn TDF as its only fuel has been demonstrated to achieve emission rates much lower than most solid fuel combustors. (EPA, Air Emissions from Scrap Tire Combustion, EPA-600/R-97-115 (October 1997), found at <http://www.epa.gov/epaoswer/non-hw/muncpl/tires/publications.htm>.)

Emission sampling from one cement kiln stack showed that carcinogenic risk declined when TDF was burned (www.epa.gov/epaoswer/non-hw/muncpl/tires/faq-tdf.htm). Laboratory testing of a Rotary Kiln Incinerator Simulator indicated that efficient combustion of supplementary TDF can destroy many volatile and semivolatile air contaminants.

V. Experiences Burning TDF in Other States

A. Cement Kilns

Data from cement kilns using tires as fuel show that some air pollutants increased and some decreased. Zinc emissions have been reported to increase when waste tires are burned. However, cement kiln emission control systems are able to remove particulate and associated zinc emissions. Burning tires starting mid-kiln can cause higher emissions of CO, but the increased emissions would comply with air quality standards. NO_x emissions are reduced when the tire fuel is introduced mid-kiln by decreasing the thermal load and peak flame temperatures. Compounds like SO₂ and acid gases are reported to show only minor variations in emissions with tire-derived fuel co-combustion.

The California Portland Cement Company performed a comparative health risk assessment of its Colton, California, plant. The individual carcinogenic risk declined 47% with TDF use, the noncarcinogenic health effects from short-term exposure fell 94%, and the noncarcinogenic health effects of continuous exposure decreased 72%.

A cement kiln operated by Lafarge Building Materials in Ravena, New York, proposed to use tire-derived fuel. Public comments expressed concern about toxic emissions, including heavy metals such as cadmium, zinc, mercury, lead, and arsenic, and PCBs, benzenes, particulate matter, volatile organic compounds, dioxins and furans, and other tire constituents. The New York Department of Environmental Conservation conducted an Air Guide-1 analysis and estimated that emissions were below 10% of the annual and short-term guidelines for emissions. Using a more refined modeling analysis yielded even lower emissions estimates. The New York DEC required stack emission testing to verify the predicted emissions and impacts.

A 2005 study by the California Air Resources Board looked at three cement plants and three cogeneration facilities that burned tires in 2003. The six facilities burned about 25% of the total number of tires discarded in California per year. The tires usually burned in a mixture of 10% tire and 90% coal/coke. Waste tires and coal/coke emit approximately the same levels of criteria pollutant emissions. The tire-burning facilities also emitted toxic air pollutants. The local air districts determined that the levels of toxics emitted from the units did not constitute a significant increase in the health risk of the exposed public.

In 2007 GlobalTox International Consultants Inc. was hired by the Nova Scotia Resource Recovery Fund Board to review an analysis of air emissions from a cement kiln in Nova Scotia. This cement plant co-combusts whole scrap tires to displace some of the coal burned by the plant. GlobalTox concluded that, for the facility in question, it did not expect the use of TDF to have a discernible effect on the health of residents in the vicinity. GlobalTox found this prediction to be consistent with the literature, which indicates that numerous cement plants around North America that have used TDF have had no difficulty in complying with operating approval conditions.

B. Industrial Boilers

The New Page mill in Bucksport, Maine, is one of the largest users of tire-derived fuel in terms of percent of heat input. This facility's ordinary fuel is a mixture of gas, bark, coal, and sludge. It substituted tires for up to 14.5% of the heat input from coal. At that level, there was no change in NO_x or SO_x, a 6% increase in particulates, and a 1% increase in total hydrocarbons. Zinc emissions increased by 885% and cadmium by 30%. Beryllium decreased by 31% and chromium by 47%, and lead was undetectable whether 100% coal or 14.5% tires were used. The 2004 Terry Grey report notes that facilities must be carefully screened to determine whether tires can be burned within acceptable environmental limits. Only a small percentage of industrial boilers have the required combination of system design, permitting conditions, and dispersed fuel type to make TDF attractive.

C. Utility Boilers

Shredded tires can be burned efficiently in utility boilers, but only in units that offer adequate time to get complete combustion, and with proper mixing with other fuels. Tire-derived fuel must be less than two inches in all dimensions with an average size of one inch or less to get complete combustion and fit most coal-handling systems. Tire-derived fuel offers a way to reduce SO_x emissions, compared to some types of coals.

D. Why Virginia Has Low TDF Usage

Different states have a variety of combustors that potentially can use tire-derived fuel, including pulp and paper mills, industrial boilers, and cement kilns. Virginia has them all, including one kiln. Yet Virginia has no indigenous TDF use.

Maryland has two cement kiln TDF users and Pennsylvania has three. North Carolina has no cement kiln but has three Cogentrix coal co-generators that consume most of North Carolina's TDF. South Carolina has a Lafarge kiln that uses TDF, but most TDF in the state is consumed by the pulp and paper industry (Bowater, Sonoco, and two International Paper facilities). Tennessee has a balanced mix (one kiln, one pulp and paper, one industrial, and one steel manufacturer). Kentucky has two electric power boilers and one pulp and paper.

Since no other States on the East Coast have an End User Reimbursement subsidy program, it is not a factor in why those States use more TDF than Virginia. In fact, the Virginia \$22.50/ton reimbursement probably helps deliver the Virginia TDF to customers in Maryland, North Carolina, and South Carolina. In order to better encourage the use of TDF in Virginia, the subsidy could be increased to apply to the TDF used only in Virginia. This would be an extra incentive for facilities *in Virginia* to use TDF.

Other States that do not support markets through a direct end user payment as Virginia does generally provide "market development" grants for capital or operating expenses of processors and end users or grants for purchasing scrap tire products (usually recycled products made from ground rubber), but they rarely provide direct support for TDF. For TDF, the grants typically pay for feed system retrofits or test burns to measure

effects on emissions. These types of grants are decreasing because emissions effects are now fairly well documented, and higher energy prices are tending to reduce the need to subsidize equipment purchases.

Perhaps these types of incentives, in addition to the End User reimbursements, are necessary to develop TDF markets in Virginia.

VI. Conclusions and Recommendations

The estimated beneficial use of Virginia's waste tires is unusually high (96%), but over half are used in landfills and their energy potential is lost forever. Of the tires used for fuel (41%), all are burned out-of-State, leaving Virginia especially vulnerable to market changes outside its borders. Many facilities in Virginia have attempted to use TDF in the past, but all these efforts have failed because of operational problems, permitting issues, costs, or public opposition. The most desirable unit for burning TDF appears to be the cement kiln. Most of these kilns are located outside Virginia, in neighboring states.

The SAB has considered these factors and makes the following recommendations. The recommendations were based on recovering more of this valuable energy resource of TDF by burning TDF in Virginia and to develop more end uses inside the Commonwealth.

1. *Promote the controlled beneficial burning of TDF:* Putting used tires in a landfill, even when they are used as daily cover, is a waste of energy resources. The tires represent petroleum or natural gas that has already been produced, and throwing it away is discarding useful fuel. The SAB recommends measures to encourage the use of scrap tires as industrial fuel, so long as the user complies with Clean Air Act requirements.

Air permitting requirements will always be a consideration when using TDF, and the recent Court of Appeals decision may make the permitting situation even more discouraging at least until EPA sets new standards. However, the State Air Pollution Control Board and SAB should remain alert for ways to improve and support TDF in Virginia. New developments (regulatory or otherwise) that might make burning tire-derived fuel easier could be communicated to potential combustors.

2. *Educate the public:* One of the goals of the 2007 Virginia Energy Plan was to "Expand consumer energy education to overcome barriers to implementing energy efficiency and conservation actions." Whenever a facility in Virginia proposes to burn TDF, public bodies could help educate the public that burning tires is not necessarily bad for the environment. The Air Board could request the SAB, DEQ's Air Division, and the Waste Tire Program and the Community Involvement Program to encourage public dialogue. A case study on the emissions from the defunct Tire Energy Plant in Martinsville might illustrate the actual air impacts of burning TDF; it could compare emissions from the plant to emissions that would have occurred had tires not been burned. Facts from actual operations, rather than fears based on tire dump fires, might help relieve public concerns. If enough interest in tire-derived fuel develops to warrant it,

DEQ might explore developing a risk-based analysis method (perhaps like New York's Air Guide-1) for calculating the public health risks of tire-derived fuel. This might help reassure the public that the risk is acceptable.

3. *Publicize the impact on Greenhouse Gas Emissions Reductions with TDF:*

Displacing coal and burning TDF would reduce CO₂ emissions. This reduction in greenhouse gas emissions would help support the 2007 Virginia Energy Plan, which states Virginia should reduce carbon emissions by 30% by year 2025 to return to its year 2000 level of greenhouse gas emissions.

4. *Support the user fee and the End User Reimbursement program:* The Air Pollution Control Board might also want to support continuing the Virginia recycling fee and subsidy for using scrap tires at \$1 per tire rather than allowing it to be reduced to 50¢ per tire. Based on our inquiries of Virginia paper mills, the subsidy is important and may make the difference between favorable and unfavorable economic decisions to use tire-derived fuel.

5. *Prepare an informational packet on air emissions/permitting issues for TDF:* In order to simplify the air permitting issues and to encourage TDF burning in Virginia, the DEQ could consider assembling an informational packet on TDF emissions. The packet could include the chemical composition of TDF and describe how various pollution control equipment designs would affect TDF burning

6. *Consider incentive grants:* Consideration could be given to offering limited incentive grants to get at least a few tire-burning operations located in Virginia. Grants could be combined with DEQ's ongoing incentive system (end user reimbursements) so that the combination might help re-establish TDF use in Virginia.

7. *Support better information on off-road tires:* Because the Rubber Manufacturers Association no longer estimates the amount of off-road scrap tires (industrial, agriculture, OTR, etc.), some of these tires may be overlooked when assessing the amount of available rubber for TDF. The Air Board might encourage industry and the DEQ to look for ways to document the amounts of these off-road tires and find ways to capture them for beneficial use.

VII. References

Conestoga-Rovers & Associates, Air Emission Assessments for Proposed Scrap Tire Co-combustion (Prepared for Nova Scotia Resource Recovery Fund Board), January 2007.

[GlobalTox International Consultants Inc., Review of the Report Entitled "Air Emission Assessment for Proposed Tire Co-combustion, Lafarge Canada Inc. Brookfield, Nova Scotia Cement Kiln," January 24, 2007.](#)

[California Air Resources Board, 2005 Report on Air Emissions From Waste Tire Burning in California, July 1, 2005](#)

Terry Gray, President, T.A.G. Resource Recovery, [Tire Derived Fuel: Environmental Characteristics and Performance, June 15, 2004.](#)

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Attachments

Attachment 1 - 2006 Virginia Waste Tire End Users
Attachment 2 - TDF Users in Virginia
Attachment 3 - EPA Tire-derived Fuel Fact Sheet

Attachment 1

Virginia Waste Tire End Users and Quantities Used – Calendar Year 2006

<u>Tire-derived Fuel (TDF)</u>	<u>Tonnages</u>	<u>% of tons Generated</u>
Primary Energy; Roxboro, NC	14,611 tons	
Primary Energy; Southport, NC	3,789 tons	
Bowater Paper; Catawba, SC	5,049 tons	
St. Lawrence Cement, Hagerstown, MD	7,073 tons	
Tire Energy Corp., Martinsville, VA	<u>5,121 tons</u>	
TOTAL	35,643 tons	<u>41%</u>
[14% in-state; 86% out-of-state]		
<u>Civil Engineering (CE)</u>		
Landfill drainage (Sussex, Goochland)	23,883 tons	
Landfill daily cover (SPSA, WM, Inc. Bristol, Wise, Prince Wm, New River)	20,144 tons	
Septic chips (SC)	<u>1,400 tons</u>	
TOTAL	45,427 tons	<u>53%</u>
<u>Recycled Products (Ground Rubber = GR)</u>		
Colored mulch	<u>1,842 tons</u>	<u>2%</u>
<u>Sub-Total Beneficially Used</u>	82,912 tons	96%
<u>Landfilled</u>	620 tons	<1%
<u>Unknown</u>	2,468 tons	3%
<u>Total Quantity</u>	86,000 tons	100%

Attachment 2

TDF Users in Virginia

Current

- Cogentrix, Chesterfield Co.
- [2 Primary Energy in NC, Bowater in SC and St. Lawrence in MD]

Former

- Tire Energy Corp, Martinsville
- SPSA W-T-E, Portsmouth
- Fairfax Co. W-T-E (Covanta)
- Bennett Mineral, King William Co.
- Georgia Pacific, Bedford Co.
- [Lehigh and ESSROC Cement, MD]

Tests Only

- International Paper, Franklin
- Smurfit Stone, West Point
- Westvaco, Covington
- Roanoke Cement Company, Botetourt Co.
- Alexandria-Arlington W-T-E (Covanta)
- Hampton/NASA W-T-E
- Va. Power, Bremo Bluff Power Station
- Cogentrix (James River), Hopewell
- Greif Riverville, Amherst Co.

Attachment 3



Tire-Derived Fuel (TDF)

The Environmental Protection Agency (EPA) supports the highest and best practical use of scrap tires in accordance with the waste management hierarchy, in order of preference: reduce, reuse, recycle, waste-to-energy, and disposal in an appropriate facility. Disposal of scrap tires in tire piles is not an acceptable management practice because of the risks posed by tire fires, and because tire piles can provide habitats for disease vectors, such as mosquitoes.

In 2003, more than 290 million scrap tires were generated in the U.S. Nearly 100 million of these tires were recycled into new products and 130 million were reused as tire-derived fuel (TDF) in various industrial facilities. TDF is one of several viable alternatives to prevent newly generated scrap tires from inappropriate disposal in tire piles, and for reducing or eliminating existing tire stockpiles.

Based on over 15 years of experience with more than 80 individual facilities, EPA recognizes that the use of tire-derived fuels is a viable alternative to the use of fossil fuels. EPA testing shows that TDF has a higher BTU value than coal. The Agency supports the responsible use of tires in portland cement kilns and other industrial facilities, so long as the candidate facilities: (1) have a tire storage and handling plan; (2) have secured a permit for all applicable state and federal environmental programs; and (3) are in compliance with all the requirements of that permit.

More information on the use of TDF in kilns and boilers is available on EPA's scrap tire web site at: <http://www.epa.gov/epaoswer/osw/non-hw/muncpl/tires.htm>. The web site also contains links to other EPA, state, and industry information on the use of TDF.